514-C 35

FLOOD INSURANCE STUDY

VILLAGE OF BUTLER, OHIO

RICHLAND COUNTY

NOVEMBER 15, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 390605

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

VILLAGE OF BUTLER,
RICHLAND COUNTY,
OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Butler, Richland County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Burgess & Niple, Limited, (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-86-C-2251. This study was completed in March 1988.

1.3 Coordination

On January 31, 1986, an initial Consultation and Coordination Officers meeting was held with representatives of FEMA, the Village of Butler, the Ohio Department of Natural Resources (ODNR), and the Study Contractor.

Upon initiation of the study, a news release was placed in the Bellville Star for the week of February 16, 1987, to state the study objectives and to notify all interested persons to submit any relevant facts and technical data concerning local flood hazards.

A search for data was made at all levels of government, specifically the U.S. Army Corps of Engineers, Huntington District; ODNR; FEMA; U.S. Geological Survey (USGS); Soil Conservation Service (SCS); Muskingum Watershed Conservancy District; and the Village of Butler. CSX Transportation, Incorporated and the Ohio Department of Transportation

(ODOT) were also contacted in order to obtain bridge data to be used in the hydraulic analysis.

An intermediate meeting was held with the Mayor of Butler on March 11, 1988, to review the preliminary floodplain and floodway boundaries. With a few minor changes in floodplain boundaries, the mayor accepted the results as presented.

On December 15, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, ODNR, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Butler, Richland County, Ohio. The area of study is shown on the Vicinity Map (Figure 1).

Flooding caused by overflow of the Clear Fork Mohican River was studied in detail.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through March 1993. The scope and methods of study were proposed to and agreed upon by FEMA and the Village of Butler.

2.2 Community Description

The Village of Butler is in southeast Richland County in north-central Ohio. It is situated about 50 miles north-northeast of the City of Columbus, Ohio, and approximately 70 miles southwest of the City of Cleveland, Ohio. The village is completely surrounded by the unincorporated areas of Richland County. The 1980 population of Butler was reported to be 955 (Reference 1).

The Clear Fork Mohican River, which flows southeast through southern Richland County, crosses into the northern portion of the Village of Butler. The stream is 36.6 miles long with an average gradient of 11.0 feet per mile (Reference 2) and has a drainage area of 217 square miles (Reference 3).

The climate of the region is classified as continental. Summers are pleasant, with low humidity and temperatures that rarely rise above 90 degrees Fahrenheit (^{o}F). Winters are cloudy with considerable snow flurry activity and daytime temperatures rarely over 32 ^{o}F. Records at the nearby City of Mansfield through 1968 show a minimum temperature of -10 ^{o}F and a maximum of 96 ^{o}F, with a mean annual temperature of 50 ^{o}F. The mean annual precipitation for the area is 30.63 inches (Reference 4).

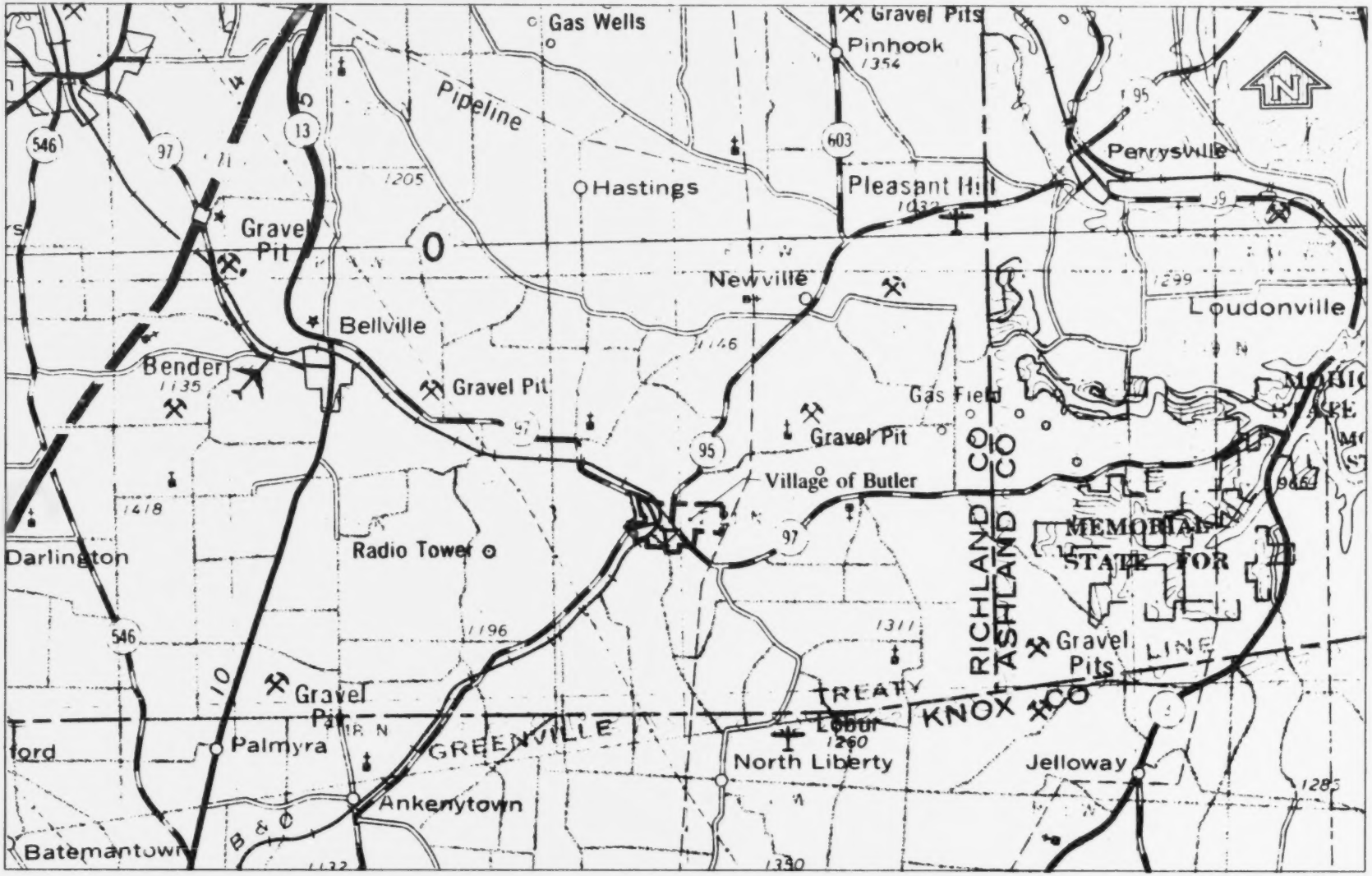


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BUTLER, OH
(RICHLAND CO.)

APPROXIMATE SCALE
2 0 2 4 6 MILES

VICINITY MAP

The Village of Butler is near the southern boundary of the Wisconsin glaciation area (Reference 5). The soils in the area consist of two primary soil associations -- the Shoals-Wheeling-Chili association and the Lordstown-Loudonville association. The Shoals-Wheeling-Chili soils occur along major streams throughout the area where there are nearly level floodplains with gently sloping to moderately steep stream valleys. These soils range from somewhat poorly drained to well drained. The Lordstown-Loudonville soils occur along narrow, moderately sloping ridge tops separated by deep valleys with steep to very steep side slopes. These soils tend to be well drained (Reference 6).

2.3 Principal Flood Problems

Major floods occurred on the Clear Fork Mohican River in January 1959 and July 1987. The discharges associated with these events recorded at the USGS gage at Butler, Ohio (No. 3-1320) were 14,300 cubic feet per second (cfs) and 21,300 cfs, respectively. The estimated return periods for these floods are approximately 100 and 500 years, respectively, and are based on flood discharge-frequency analyses at the gage (Reference 7). Flood levels of the July 1987 flood in and near the Village of Butler are shown in Figures 2 through 5.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

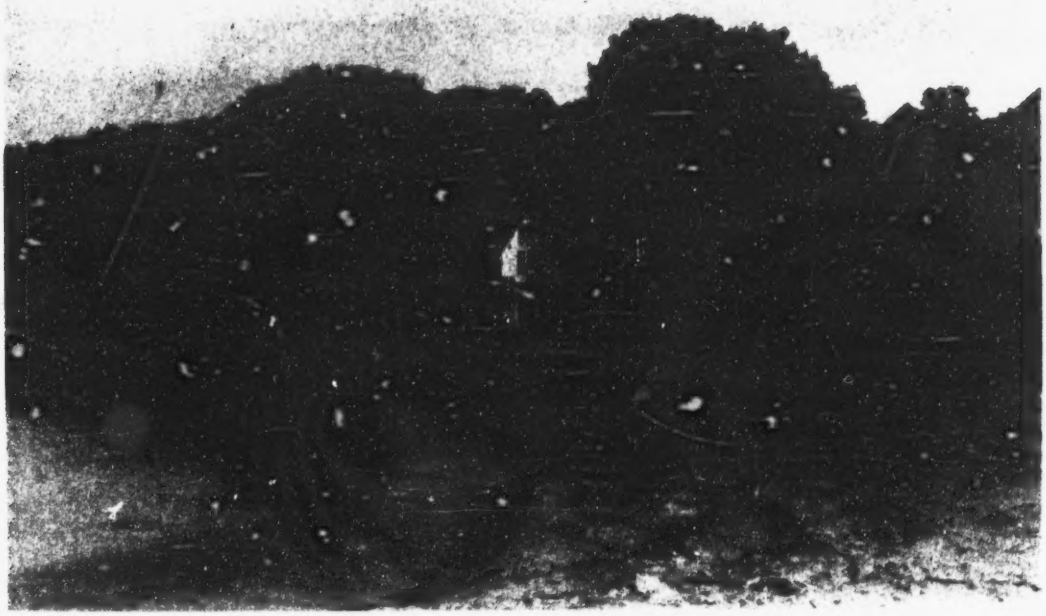


Figure 2 July 1987 flood at Swank-Aire farm off State Route 97, just north of the Village of Butler. (Photograph courtesy of the Bellville Star.).

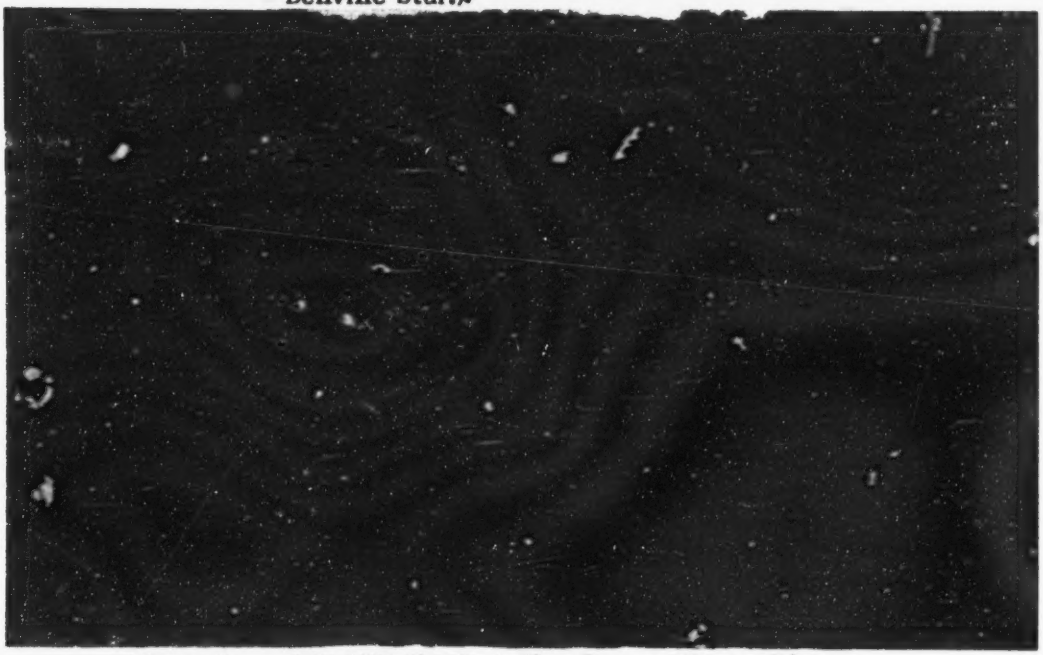


Figure 3 July 1987 flood at Blue Lagoon Canoe Livery just off State Route 97, northwest of the Village of Butler. (Photograph courtesy of the Bellville Star.)

Figure 4 July 1987 flood in the vicinity of Traxler and Grant Street. (Photo courtesy of Village of Butler.)

Figure 5 July 1987 flood just northeast of State Route 95 bridge over the Clear Fork Mohican River. (Photo courtesy of Village of Butler.)

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The stream gage on the Clear Fork Mohican River in the village has a continuous period of record from 1944 through 1975. The 100-year flood frequency peak discharge (10,500 cfs) given for this gage in Ohio Bulletin 45 (Reference 8) was revised by the USGS following the July 1987 event. The revised values were used for this study.

There is some change in drainage area of Clear Fork through the study reach. Transfer techniques recommended in the previously referenced Bulletin 45 were used in conjunction with the updated gage 100-year peak discharge to determine discharges through the study reach.

Peak discharge-drainage area relationships for the 100-year flood of the flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 100-YEAR
CLEAR FORK MOHICAN RIVER		
just downstream of Slater Run	151.3	15,200
just upstream of Slater Run	142.6	14,600
just downstream of Smoky Run	142.3	14,600
just upstream of Smoky Run	136.0	14,100

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Photogrammetry was employed to obtain floodplain cross sections and the State Route 95 bridge/roadway profile. The below-water portion of selected cross sections and the State Route 95 bridge were field surveyed. Other aspects of the State Route 95 bridge-waterway opening were taken from available bridge plans.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Channel and overbank roughness coefficients (Manning's "n") for the Clear Fork Mohican River were chosen based on field observation of the stream and floodplain areas. The channel "n" value is 0.052, while the overbank "n" values range from 0.075 to 0.180.

Water-surface elevations were computed using the HEC-2 step-backwater computer program (Reference 9). Starting water-surface elevations were determined using the slope-area method.

The rating curve for the gage station at Butler was revised by the USGS following the July 1987 flood. The water-surface elevation calculated at that gage for this report agrees with the gage height associated with the 100-year discharge determined from the rating curve.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (Reference 10).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the Clear Fork Mohican River lie outside the corporate limits.

Along streams where base flood elevations have been established and floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 6.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
CLEAR FORK MOHICAN RIVER								
A	76,180	1125[2]	5770	2.4	1067.6	1067.6	1068.5	0.9

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BUTLER, OH
(RICHLAND CO.)

FLOODWAY DATA

CLEAR FORK MOHICAN RIVER

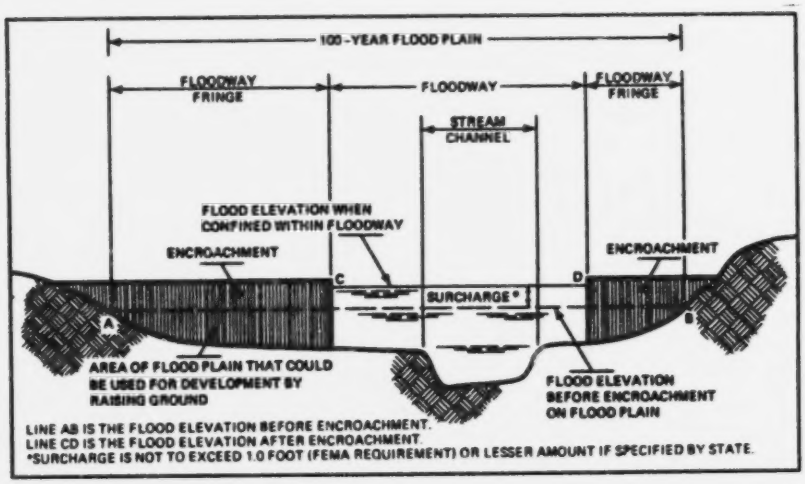

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 6 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Preparation of the Flood Insurance Study for Richland County, Ohio, has begun (Reference 11). However, work has not progressed sufficiently to date to permit a comparison with the determinations contained in this report.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for the Village of Butler (Reference 12).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Ohio, Washington, D.C., February 1982.

2. Ohio Department of Natural Resources, Division of Water, Report No. 12, Gazetteer of Ohio Streams, 1960.

3. ————, Division of Water, Report No. 12A, Drainage Areas of Ohio Streams, 1967.

4. ————, Division of Water, Climatic Guide for Selected Locations in Ohio, Marvin E. Miller.

5. ————, Division of Geological Survey, Bulletin 65, Ohio-An American Heartland, 1975.

6. ————, Division of Lands and Soil, A General Soil Map of Richland County, 1972.

7. U.S. Geological Survey, Annual Peak Flow Frequency Analysis, Washington, D.C., September 1987.

8. Ohio Department of Natural Resources, Division of Water, Bulletin 45, Floods in Ohio, Magnitude and Frequency, May 1977.

9. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, April 1984.

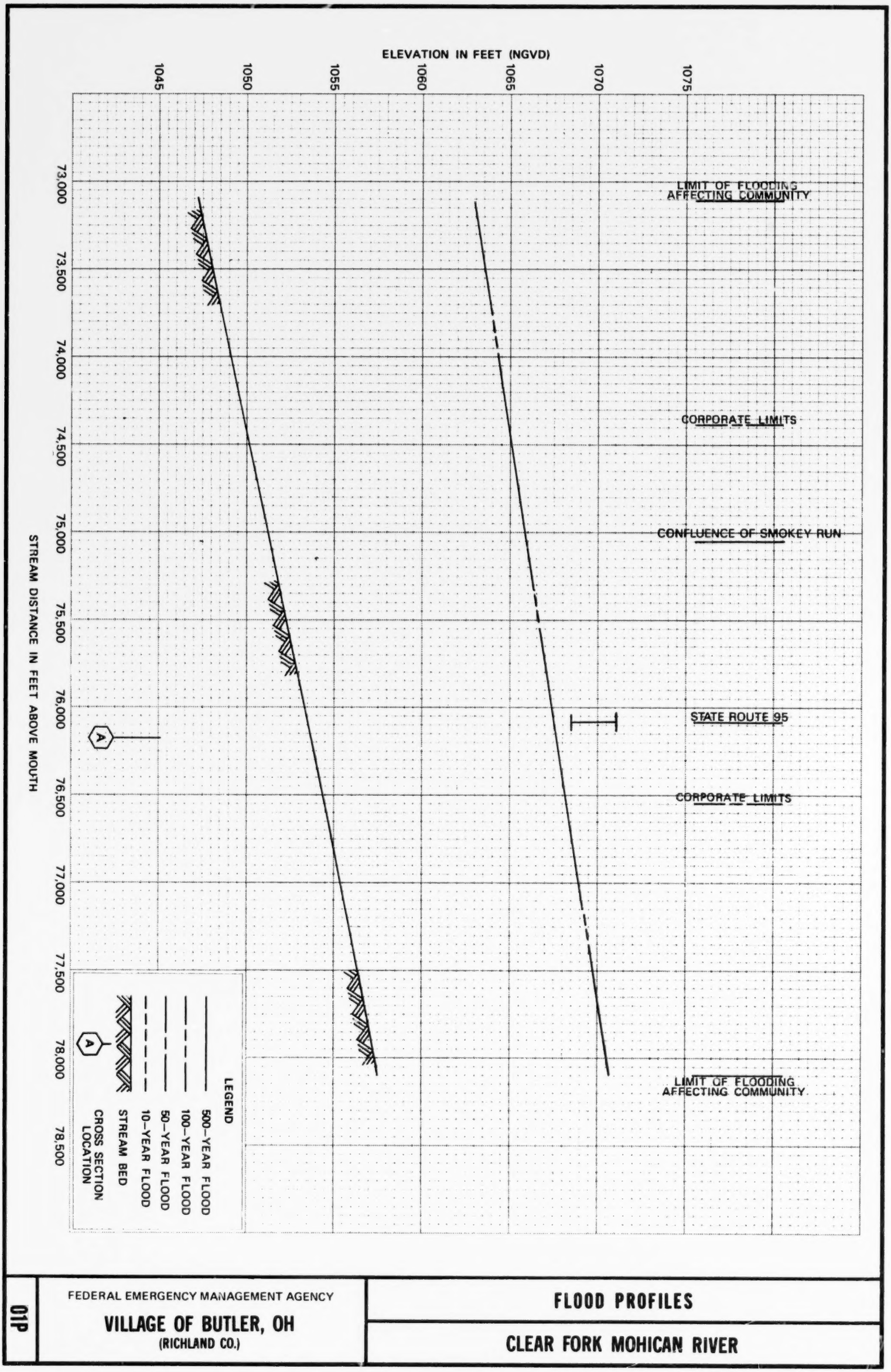
10. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: Butler, Ohio, 1961.

11. Federal Emergency Management Agency, Flood Insurance Study, Richland County, Unincorporated Areas, Ohio, in progress.

12. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Butler, Richland County, Ohio, September 1978.

ELEVATION REFERENCE MARK

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0001	1,073.42	mark in top of concrete post located 94 feet north of northeast corner of CSX station building, about 17 feet west of west rail of CSX railroad tracks



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01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **VILLAGE OF BUTLER, OH** (RICHLAND CO.)	**FLOOD PROFILES** **CLEAR FORK MOHICAN RIVER**